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PREDICTING STUDENT ACCOMPLISHMENT IN COLLEGE FROM THE ACT ASSESSMENT.

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TO EVALUATE THE PREDICTIVE VALIDITY OF THE ACT TESTS AND THE NON-ACADEMIC ACHIEVEMENT SCALES OF THE STUDENT PROFILE SECTION, AT 14 2-YEAR AND 21 4-YEAR COLLEGES STUDENTS WHO HAD COMPLETED THE ACT BATTERY PRIOR TO ADMISSION WERE SURVEYED FOR THEIR ACADEMIC AND NON-ACADEMIC ACCOMPLISHMENTS DURING THEIR FRESHMAN YEAR. CRITERIA INCLUDED COLLEGE GRADES, 12 SCALES DESIGNED TO MEASURE NOTABLE EXTRA-CLASSROOM ACCOMPLISHMENT IN COLLEGE, AND ONE SCALE TO ASSESS RECOGNITION FOR ACADEMIC ACCOMPLISHMENT. PREDICTORS INCLUDED SCORES ON ACT TESTS, HIGH SCHOOL GRADES, AND THE SIX SCALES MEASURING NON-ACADEMIC ACCOMPLISHMENT IN HIGH SCHOOL. THE RESULTS, WHICH SUPPORT THE AUTHORS' EARLIER FINDINGS, INDICATE THAT NON-ACADEMIC ACCOMPLISHMENT CAN BE ASSESSED WITH MODERATE RELIABILITY, THAT BOTH ACADEMIC AND NON-ACADEMIC ACHIEVEMENT CAN BE PREDICTED TO A USEFUL DEGREE, AND THAT NON-ACADEMIC ACCOMPLISHMENT IS LARGELY INDEPENDENT OF ACADEMIC POTENTIAL AND ACHIEVEMENT. (AUTHORS/HH)

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Summary

The purpose of the present study is to evaluate the predictive validity of the ACT assessment--the ACT tests and the non-academic achievement scales of the Student Profile Section. At 35 diverse institutions, students who had completed the ACT battery prior to college admission were surveyed for their academic and non-academic accomplishments during their freshman year. Criteria included college grades, twelve scales designed to measure notable extra-classroom accomplishment in college, and one scale to assess recognition for academic accomplishment. Predictors included scores on ACT tests, high school grades, and the six scales measuring non-academic accomplishment in high school. The results, which support our earlier findings, indicate that non-academic accomplishment can be assessed with moderate reliability, that both academic and non-academic accomplishment can be predicted to a useful degree, and that non-academic accomplishment is largely independent of academic potential and achievement.

Predicting Student Accomplishment in College from the ACT Assessment

James M. Richards, Jr. and Sandra W. Lutz

In the interest of human and social values, educational institutions should be concerned with finding students who will do outstanding things outside the classroom and in later life as well as students who have the ability to get satisfactory grades. If we are to find such students, we need a better record of students' competencies and achievement during the high school years. Further, we should consider such measures important in their own right rather than weak supplementary measures to remedy the slight defects of conventional aptitude and achievement tests.

The Student Profile Section was added to the ACT battery in the fall of 1965 to fill this need in part. It is a short biographical inventory containing the kind of information often requested in college application blanks. However, it collects and reports this information in a more systematic fashion than do similar institutional forms. Specifically, it gives the student the opportunity to tell the prospective colleges about his aspirations, goals, anticipated personnel needs (such as housing and financial aid), and non-classroom achievements.

The purpose of the present study is to evaluate the predictive validity of the ACT Assessment--the ACT tests and the non-aca-

demic achievement scales of the Student Profile Section. The ACT tests have been validated many times (American College Testing Program, 1965, 1966; Munday, in press) and the validity of similar non-academic accomplishment scales has been studied (Richards, Holland, & Lutz, 1966b). The present study is the first, however, to assess simultaneously the predictive validity of measures of academic and non-academic accomplishment obtained as part of a college admissions testing program. Thus it is a replication and extension, in a diverse group of two- and four-year colleges, of our previous research on the relationships among non-academic accomplishment, academic potential, and academic accomplishment (Holland, 1961; Holland & Astin, 1962; Holland & Nichols, 1964; Holland & Richards, 1965,1966; Richards et al., 1966a, 1966b).

Method

Predictors

The predictive variables included the following measures:

ACT Tests. The test battery, a college admissions test administered nationally, yields the following subtest scores: English, mathematics, social studies and natural science. Each score is converted to a common scale with a mean of approximately 20 and a standard deviation of about 5 for college-bound high school seniors. The reliabilities of the ACT tests (American

College Testing Program, 1965), the high correlations between the ACT battery and other similar measures (Eells, 1962), and the similar relationship of the ACT battery and of similar measures to college grades (Munday, 1965) all indicate that the ACT battery is a typical measure of academic potential. Therefore, we would not expect markedly different results in the present study if we had used some other academic test or test battery.

High School Grades. As a regular part of the ACT procedure, persons taking the ACT battery report the grades they have received in high school courses in four areas: English, mathematics, social studies, and natural science. Research by Davidsen (1963) indicates that, in a large sample, such self-reported grades correspond closely to the high school transcripts. A reanalysis of Davidsen's data yielded a correlation of .92 between student-reported and school-reported grades. The measure used in the present study is the overall average on a four-point scale (A = 4, B = 3, etc.) of all grades reported. In another study by Hoyt (1963) the predictive efficiency of average self-reported grades equaled the predictive efficiency of the student's rank in the high school class obtained from his transcript.

Non-Academic Achievement Scales. A checklist of extra-curricular accomplishment was developed to obtain scores in the following areas: leadership, music, drama and speech, art, writing,

and science. Each scale consisted of eight items ranging from common and less important accomplishments to rarer and more important ones. For example, science items included such accomplishments as "performed an independent scientific experiment" or "won a prize or award of any kind for scientific work or study." In general, the accomplishments involve public action or recognition, so that in principle the accomplishments could be verified. The score on each scale is simply the number of accomplishments the student marks "Yes, applies to me." Students with high scores on one or more of these simple scales presumably have attained a high level of accomplishment, which requires complex skills, long-term persistence, or originality. These scales are discussed in detail elsewhere (American College Testing Program, 1965; Holland & Richards, 1966).

Criteria of Achievement

The criterion variables included the following measures:

College Grades. Each student reported his grade average for his last college term by checking one of the following alternatives: D or lower, D+, C, C+, B, B+, A or A+. Scores from 1 to 7 were assigned to these alternatives so that a high score indicates high grades. Also, as a check on the accuracy with which students reported their accomplishments, the colleges were asked to report the grade average for each student on a standard four-point scale

where A = 4.00, B = 3.00, C = 2.00, D = 1.00, and a failing grade = 0.00.

Non-Classroom Achievement Record. We used a checklist of non-academic accomplishments to measure achievement in the following areas: leadership, social participation, art, social service, science, business, humanities, religious service, music, writing, social science, and speech and drama. We also developed a simple scale to determine public recognition for academic attainment in college. Each scale is, in a sense, a criterion or standard of accomplishment in an important area of human endeavor. A detailed account of the rationale, development, and statistical characteristics of these scales is presented elsewhere (Richards et al., 1966a, 1966b).

Each scale includes ten items, except the Recognition for Academic Accomplishment Scale which has five items. In responding to the items, the student marks "yes" for those accomplishments which he has achieved during college and "no" for those which he has not achieved. The score on each scale is simply the number of "yes" responses.

Items range from common and less important accomplishments to rare and more important ones. For example, leadership accomplishments included: elected to one or more student offices, active member of four or more student groups, served on a student-faculty committee. Music accomplishments included: composed or

arranged music which was publicly performed, publicly performed on two or more music instruments, attained a first division rating in a state or regional solo music contest. The remaining scales consisted of similar items with content appropriate to the various areas of achievement. In general, the accomplishments involve public action or recognition, so that, in principle, they could be verified by comparing student self-reports with public records. We assumed that the possibility of verification would lessen student exaggeration.

The non-classroom achievement scales were administered as part of a comprehensive follow-up of the Student Profile Section. We used a special questionnaire, so that students could mark their answers to questions directly on the questionnaire booklet. The entire booklet was then run through an optical-scanner scoring machine.[1] The follow-up questionnaire elicited information about a college student's achievements, goals, satisfactions, living circumstances, and self-evaluated change since entering college.

The Sample

The Student Profile Section follow-up was administered in the spring of 1966 to students completing their freshman year at thirty-five colleges. Fourteen of these colleges were two-year

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[1]The layout of these forms was developed and the scoring was performed by National Computer Systems, Minneapolis, Minnesota.

colleges, and twenty-one offered four years of undergraduate education. These colleges were chosen from institutions participating in ACT's 1966 Class Profile Research Service (American College Testing Program, 1966). The particular colleges included are listed in Table 1.

Table 1

Colleges Included in the Sample

Two-Year Colleges	
Fresno City College, California	Lake Michigan College, Michigan
Hartnell College, California	Mary Holmes Junior College, Mississippi
Santa Rosa Junior College, California	Murray State Agricultural College, Oklahoma
Otero Junior College, Colorado	Community College of Philadelphia, Pennsylvania
Thornton College, Illinois	Panola College, Texas
Fort Dodge Community College, Iowa	College of Eastern Utah
St. John's College, Kansas	Potomac State College, West Va.

Four-Year Colleges	
LaSierra College, California	Bluffton College, Ohio
Illinois Teachers College: Chicago South	Langston University, Oklahoma
Illinois College	Mount Marty College, South Dakota
University of Illinois	South Dakota School of Mines and Technology
Central College, Iowa	Tennessee State University
William Penn College, Iowa	Tusculum College, Tennessee
Wichita State University, Kansas	McMurry College, Texas
Mount St. Mary's College, Maryland	Midwestern University, Texas
Michigan Technological University	North Texas State University
Chadron State College, Nebraska	Wisconsin State University at Stevens Point
New Mexico Highlands University	

It would be helpful to know the extent to which these colleges are like American colleges in general. Astin (1965) recently published a comprehensive description of the"environments" of 1015 four-year colleges in terms of eight characteristics: selectivity, size, and six "personal orientations"--Realistic, Intellectual, Social, Conventional, Enterprising, and Artistic--based on the proportion of students in each of six classes of major field (Holland, 1966; Astin & Holland, 1961). Astin reports scores for colleges on these variables using a standard scale with a mean of approximately 50 and a standard deviation of approximately 10.

A description of junior college environments has also been published (Richards, Rand, & Rand, 1965, 1966). Through factor analysis, a brief profile was developed for describing junior college environments. This profile consists of six factors: Private Control (or Cultural Affluence), Technological Specialization, Size, Conventionalism (or Age), Transfer Emphasis, and High Cost (or Business Orientation). Estimated scores on these factors are available in the form of stanines (Guilford, 1956, p. 503), which are normalized standard scores, ranging from 1 to 9, with a mean of 5 and a standard deviation of 1.96.

Of the colleges in this sample, 13 two-year colleges and 19 four-year colleges are included in these lists. We computed means and standard deviations for these colleges on the environmental

description scales. Results are summarized in Table 2. These results show that, in a number of cases, the mean for the sample colleges deviates from the all-college mean by half a standard deviation or more. The pattern of differences is consistent with the type of college using ACT services. Therefore, it appears that our sample is more representative of ACT colleges than of colleges in general.

Table 2

Mean and Standard Deviation of Sample Colleges on Environmental Description Scales

	Mean	S. D.
Two-Year Colleges (N = 13)		
Private Control (Cult. Aff.)	5.1	1.4
Tech. Special.	5.1	1.3
Size	5.8	1.4
Conventionalism (Age)	6.1	1.4
Trans. Emph.	6.1	1.3
High Cost (Bus. Orientation)	4.6	1.4
Four-Year Colleges (N = 19)		
Selectivity	45.11	7.43
Size	51.11	10.47
Realistic Or.	54.42	9.22
Scientific Or.	52.95	9.36
Social Or.	48.58	9.50
Conventional Or.	51.84	8.55
Enterprising Or.	48.47	7.52
Artistic Or.	46.79	8.59

Note.--Environmental description scales are taken from Richards, Rand, & Rand (1965, 1966) for two-year colleges and from Astin (1965) for four-year colleges.

For each college, the investigators picked a group of students to be included in the follow-up. The procedure for selecting students is a compromise between a sample representative of students and a sample representative of institutions. Specifically, at small institutions all freshmen were followed up, and at large institutions a sample of freshmen were followed up.[2] At large institutions, the sample was drawn by taking every nth name on the Class Profile Service roster, with n chosen so that no more than 475 students from any one institution would be followed up. The total number of students followed up was 8908. The number of students at individual institutions ranged from 33 to 471 with a median of 251.

We sent a questionnaire stamped with the name of each student to be followed up to his college, together with a roster of students on which the college indicated college GPAs and the current status (e.g., enrolled but did not respond, no longer enrolled, etc.) of students in the sample who did not complete the questionnaire. Each college was responsible for the administration of the follow-up questionnaire. Several techniques were used to contact students: some colleges had students fill out the questionnaire in English classes, convocations, or other group sessions; other colleges polled their students by mail. Complete follow-up data were obtained for 5695 freshmen (3267 males and 2428 females). Students with

[2]The sample is restricted, of course, to those freshmen who took the ACT battery.

missing follow-up data include both 1441 students who left college and 1772 students still enrolled in college who failed to complete the questionnaire. The return rates at individual colleges ranged from 18.0% to 92.7% with a median of 74.0%. The rates of return at individual colleges for students still enrolled ranged from 22.6% to 100% with a median of 87.7%.

Although the return rate is fairly high, it is important to know what biases there may be in the sample with follow-up data. Accordingly, we computed the mean and standard deviation on each of the predictor variables for each of three groups: students with follow-up data, students still enrolled who failed to complete the follow-up questionnaire, and students no longer enrolled.[3] We also computed "t" tests between students with follow-up and each of the other two groups. While no overall analyses of variance were computed, and while each "t" test is not completely independent of every other test (some of the variables are correlated to a substantial degree), for the purpose of this study any error introduced is conservative since it is more likely that a number of significant differences will be found between students with and without follow-up data. Results are summarized in Table 3.

The primary trend in Table 3 is for students who are no longer in school to have lower ACT scores and high school grades than students with follow-up data. This is to be expected, of course,

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[3]These computations were carried out at Measurement Research Center, University of Iowa.

since many students leave school in their freshman year because of academic failure. Males who left school also tended to be lower on the non-academic accomplishment scales. No consistent pattern appeared for the comparison of students still in school with and without follow-up data.

Table 3

Comparison of Students With and Without Follow-up Data on Predictor Variables

	Variables							
	With F-up Data		In School No Data		No longer in School		t tests	
	Mean	S. D.	Mean	S. D.	Mean	S. D.	1 vs. 2	1 vs. 3
Males								
ACT English	17.6	5.5	17.7	5.0	15.4	5.5	.55	10.70**
ACT Math	21.0	6.9	20.8	6.3	17.8	6.3	.87	13.28**
ACT Soc. Stu.	20.6	6.7	20.9	6.2	17.7	7.0	1.34	11.17**
ACT Nat. Sci.	20.9	6.7	21.1	6.1	18.8	6.7	.90	8.37**
HS GPA	2.59	.68	2.42	.69	2.22	.64	6.94**	15.10**
HS Lead. Ach.	2.22	1.90	1.93	1.80	1.78	1.80	3.91**	5.46**
HS Music	1.19	1.70	1.18	1.89	1.12	1.80	.13	.89
HS Drama	1.06	1.41	.84	1.36	.90	1.37	3.95**	2.63**
HS Art	.42	1.02	.55	1.20	.55	1.18	2.77**	2.60**
HS Writing	.64	1.07	.53	.96	.53	.98	2.84**	2.52*
HS Science	.90	1.37	.88	1.42	.77	1.24	.34	2.30*
Females								
ACT English	19.0	5.5	19.3	4.9	17.3	5.7	1.38	5.81**
ACT Math	17.0	6.6	16.5	5.8	14.6	6.0	1.94	7.62**
ACT Soc. Stu.	19.4	7.0	19.8	6.4	17.6	6.5	1.42	5.30**
ACT Nat. Sci.	18.6	6.3	18.9	5.9	16.6	5.9	1.16	6.49**
HS GPA	2.80	.66	2.69	.66	2.49	.61	4.15**	9.81**
HS Lead. Ach.	2.32	1.82	2.23	1.89	2.19	1.90	.98	1.16
HS Music	1.78	1.82	1.82	1.91	1.65	1.84	.43	1.19
HS Drama	1.42	1.52	1.34	1.48	1.52	1.57	1.11	1.08
HS Art	.52	1.06	.53	1.11	.65	1.27	.19	1.75
HS Writing	1.06	1.28	.95	1.30	.98	1.22	1.74	1.08
HS Science	.48	1.01	.54	1.06	.42	.92	1.18	1.08

*P<.05, **P<.01

Because the Ns in this study are very large, a small absolute difference can be highly significant. For the most part, the actual differences are small, relative to the standard deviations. Moreover, a full range of talent is present in the groups with follow-up data. It appears unlikely, therefore, that the results of this study are seriously distorted by differences between students with and without follow-up data.

The non-academic achievement scales rest on student self-reports, and the memory and honesty of students are important. In particular, we should check the effect of a student's exaggerating his achievements. Therefore, we developed two special scales, the Infrequency Scales, one for high school achievements (Holland & Richards, 1966), and one for college achievements. The rationale for these scales is that a student who is exaggerating his achievements is likely to claim rare accomplishments in several different areas. Accordingly, by combining male and female data, we identified the item on each achievement scale claimed least frequently. The score on the Infrequency Scale is simply the number of these rare achievements claimed by the student.

The relationships between the high school Infrequency Scale and the predictor variables have been reported in detail elsewhere (Holland & Richards, 1966). As a check on the influence of exaggeration in the present study, we identified students with high scores on either or both of the Infrequency Scales (a high score was defined as a

score of 4 or higher). Among students with follow-up data, 78 had high Infrequency scores --49 male and 29 female-- or about 1% of the sample. We made the basic computations for this study twice, first including all students, and second excluding students with high Infrequency scores.

Results

The mean and standard deviations of the college achievement scales for the various groups are summarized in Table 4. Different units were used for the two college GPA variables; colleges reported GPAs on a four-point scale while students estimated their overall GPA by responding to a seven-alternative question. The distributions of the non-academic accomplishments are highly skewed and almost dichotomous, so that the standard deviations are larger than the means.[4] This skewness occurs because each scale contains accomplishments that are rare among college freshmen (the modal number of accomplishments on most scales is zero). Differences among the areas of accomplishment probably reflect differences both in the level of accomplishment represented by the various items and in the opportunity for various kinds of achievement in college. The results with high Infrequency students eliminated suggest that

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[4]The skewness of such distributions has had little effect in previous studies, however, on Pearson correlations involving similar variables (Holland & Richards, 1965). It is possible that the results of this study are distorted by the use of skewed, almost dichotomous variables in multiple regression analysis, although the consistency and meaningfulness of our results suggest that such distortion is unlikely.

student exaggeration had little effect on the findings.

Table 4

Means and Standard Deviations for College Achievement Scales

	All Students				High Infre. Students Elim.			
	Males		Females		Males		Females	
	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.
Coll. GPA (C. Rep.)[a]	2.18	.69	2.38	.70	2.18	.69	2.38	.70
Coll. GPA (Stu. Rep.)[a]	3.65	1.27	3.98	1.27	3.65	1.27	3.98	1.27
Rec. A. Ach.	.17	.50	.19	.51	.16	.49	.19	.51
Lead Ach	.47	1.19	.53	1.11	.46	1.14	.53	1.10
Mus Ach	.20	.75	.18	.60	.19	.70	.18	.59
Sp and Dr Ach	.25	.80	.31	.92	.24	.75	.31	.92
Art Ach	.45	1.03	.59	1.04	.43	.96	.58	1.04
Writ Ach	.26	.74	.38	.79	.25	.67	.38	.78
Sci Ach	.19	.63	.06	.31	.19	.58	.06	.31
Soc Par	.72	1.26	.66	1.10	.71	1.20	.66	1.10
Soc Ser Ach	.54	1.06	.75	1.11	.53	1.02	.74	1.11
Bus Ach	.61	.92	.28	.58	.60	.88	.28	.58
Hum-Cul Ach	.93	1.26	1.18	1.35	.92	1.23	1.17	1.34
Rel Ser	1.19	1.96	1.77	2.20	1.19	1.94	1.76	2.19
Soc Sci Ach	.29	.68	.25	.57	.28	.62	.25	.55

[a] Colleges reported grades on a 1.00 to 4.00 scale, while students reported grades by answering a seven-alternative question.

As a next step, correlations were computed among all variables, both predictor and criterion.[5] A missing data program was used because some students failed to complete all scales. The results for all students are reported in Table 5 and results with the high Infrequency students eliminated, in Table 6. Correlations for males

[5] These computations were carried out at the University of Utah Computer Center.

Table 5

Intercorrelations of Predictors and Criteria for All Students at All Colleges

	act eng	act math	act s. s.	act n sci	hs GPA	hs lead	hs mus	hs dr	hs art	hs writ	hs sci	col GPA (c. r.)	col GPA (s. r)	col r. a. a	col la	col ma	col s&d	col art	col writ	col sci	col s. p. s	col ser	col bus	col h-c	col rel	col s. sci
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1.	--	68	74	72	41	-01	04	-01	-07	06	04	41	35	20	03	-01	-03	00	05	00	-05	-07	-06	01	-09	-09
2.	65	--	66	70	47	-04	00	-06	-10	-01	09	44	35	22	03	-07	-09	-06	-01	02	-07	-08	-07	-07	-11	-14
3.	76	64	--	77	39	-02	00	-02	-07	07	05	42	35	18	05	-04	-02	-01	07	01	-01	-04	-04	07	-09	-04
4.	72	65	77	--	39	-04	03	-01	-04	03	12	38	31	16	03	-05	-05	-02	02	03	-05	-05	-06	00	-10	-10
5.	38	42	38	36	--	14	01	04	-05	08	10	50	47	30	05	-05	-04	-05	00	04	-02	-04	-09	01	-03	-03
6.	-01	01	-03	-02	14	--	23	44	23	43	31	05	08	09	23	06	10	09	12	05	26	15	05	16	08	12
7.	06	08	04	04	05	24	--	35	31	35	30	02	02	03	06	32	05	09	03	04	04	04	05	04	07	00
8.	-01	-03	-01	02	08	42	29	--	39	54	38	02	04	04	13	06	21	09	12	01	16	12	06	12	11	08
9.	01	-01	02	03	-05	20	20	32	--	48	41	-03	-02	-02	07	02	07	31	07	05	07	05	05	06	04	03
10.	18	09	15	14	15	39	24	46	37	--	41	06	09	07	15	02	11	12	22	02	17	09	03	18	07	11
11.	-02	01	01	05	08	29	23	36	44	41	--	04	05	07	05	06	03	15	06	21	10	06	04	12	03	06
12.	45	43	44	43	54	07	08	05	00	10	02	--	84	39	14	-02	00	00	06	03	00	00	-08	03	-04	-02
13.	40	38	38	38	52	10	09	07	01	13	07	87	--	39	19	00	04	04	09	04	07	04	-04	09	03	03
14.	14	18	15	14	25	11	07	05	08	11	13	40	40	--	21	10	17	10	19	20	13	12	06	14	06	13
15.	06	05	06	06	06	20	10	16	10	16	12	15	13	22	--	12	20	24	26	11	44	43	16	14	17	16
16.	-09	-05	-07	-05	-01	07	35	12	01	06	07	-02	02	06	10	--	21	23	23	21	16	19	22	17	21	21
17.	-03	-03	-01	-01	01	13	07	26	05	13	02	03	03	10	19	20	--	29	38	18	32	30	19	32	23	31
18.	03	-01	04	03	-09	11	07	14	34	14	10	-06	-01	05	17	11	17	--	35	27	34	30	22	27	19	23
19.	09	03	11	08	01	15	06	22	12	30	06	00	05	07	18	11	27	32	--	25	37	26	23	44	22	41
20.	-06	-01	-04	-01	03	09	06	07	07	11	21	01	04	06	06	09	05	12	12	--	21	21	25	29	18	29
21.	-09	-08	-07	-08	-04	24	07	17	07	15	09	-08	-02	09	26	11	20	29	27	14	--	43	24	35	24	34
22.	-06	-07	-05	-05	-02	17	09	12	06	13	12	-03	01	10	35	14	21	23	18	12	39	--	27	27	35	29
23.	-07	-04	-06	-08	-04	06	01	03	-02	02	03	-07	-03	07	15	12	10	12	13	14	17	23	--	21	24	21
24.	-01	-06	06	01	00	16	06	17	14	24	16	-04	04	11	15	13	22	33	43	18	32	25	14	--	20	48
25.	-10	-08	-09	-07	03	11	10	14	01	10	09	01	05	10	14	24	22	11	14	13	24	39	20	21	--	22
26.	-14	-11	-06	-10	-02	12	01	08	08	11	09	-06	00	11	12	10	17	23	27	15	33	21	14	41	19	--

Note. --Correlations for males are shown above the diagonal and for females below the diagonal.

Table 6

Intercorrelations of Predictors and Criteria for Students at All Colleges with High Infrequency Students Eliminated

	act eng 1	act math 2	act ss 3	act n sci 4	hs GPA 5	hs lead 6	hs mus 7	hs dr 8	hs art 9	hs writ 10	hs sci 11	col GPA (c.r.) 12	col GPA (s.r.) 13	col r. aa 14	col la 15	col ma 16	col s&d 17	col art 18	col writ 19	col sci 20	col s. p 21	col s serbus 22	col 23	col h-c 24	col rel 25	col s sci 26
1.	--	68	74	72	40	00	06	01	-06	13	09	41	35	21	04	-01	-03	00	06	00	-04	-06	-05	01	-09	-10
2.	65	--	66	70	47	-03	01	-06	-10	02	14	44	35	24	05	-07	-09	-05	-01	03	-07	-07	-07	-08	-11	-14
3.	75	64	--	77	39	-02	00	-01	-07	13	09	42	35	19	06	-05	-02	-01	08	01	00	-03	-04	07	-09	-04
4.	72	65	77	--	39	-04	04	00	-03	07	17	38	31	18	04	-05	-04	-01	03	04	-04	-04	-05	00	-10	-10
5.	38	42	37	35	--	15	01	05	-05	14	13	50	47	30	06	-05	-04	-05	00	04	-02	-04	-09	01	-03	-04
6.	-01	02	-02	-02	14	--	14	37	08	33	20	06	09	09	25	06	11	09	13	06	29	16	05	17	09	13
7.	06	08	04	04	05	20	--	21	10	12	12	03	03	03	06	38	07	09	04	04	04	04	05	05	09	00
8.	00	-03	00	02	08	38	23	--	14	34	19	04	05	05	15	07	27	10	17	03	19	15	07	15	14	11
9.	01	00	02	01	-07	11	07	14	--	13	18	-01	00	-04	08	04	10	41	10	08	09	06	06	09	06	05
10.	22	11	18	15	18	34	14	36	11	--	16	11	14	09	19	05	16	14	32	05	23	12	03	26	11	16
11.	-02	04	02	05	11	22	10	20	13	15	--	07	07	09	05	08	05	16	09	28	11	07	05	17	05	10
12.	45	43	43	43	54	07	08	05	-01	11	01	--	85	40	15	-03	00	-01	06	03	00	00	-08	03	-05	-03
13.	40	38	38	37	52	11	08	07	00	14	07	86	--	41	19	00	03	03	09	04	07	04	-04	09	03	03
14.	15	18	15	14	25	11	06	04	07	11	13	40	40	--	18	-01	09	02	09	10	07	06	-02	09	02	04
15.	06	05	06	06	06	21	09	16	09	16	11	15	13	22	--	07	16	18	21	05	39	39	12	11	15	11
16.	-08	-04	-06	-05	-01	07	37	11	00	05	07	-02	03	05	09	--	11	14	10	07	08	11	13	09	17	08
17.	-02	-03	-01	-01	01	13	07	28	07	16	03	03	03	10	19	20	--	22	29	08	27	23	10	27	19	21
18.	03	-01	04	03	-10	11	08	14	42	15	11	-05	-01	05	17	10	16	--	27	18	27	23	15	23	15	15
19.	10	03	11	09	01	15	07	23	15	35	09	00	05	06	18	09	26	31	--	11	30	17	13	40	18	30
20.	-06	-01	-04	00	03	09	06	07	08	12	26	01	04	07	06	09	05	13	12	--	13	13	16	23	13	18
21.	-09	-08	-07	-08	-03	24	08	18	08	18	11	-08	-02	09	26	10	20	28	27	15	--	38	19	32	21	29
22.	-06	-07	-04	-05	-02	17	09	13	07	14	13	-03	01	11	35	14	21	23	18	12	39	--	20	23	32	22
23.	-07	-04	-06	-07	-04	07	01	03	-02	03	04	-07	-03	07	14	13	10	12	13	14	17	23	--	16	21	12
24.	-01	-06	06	01	00	16	06	18	15	27	18	-04	04	10	15	12	21	33	43	18	32	25	13	--	17	43
25.	-10	-08	-09	-06	04	11	10	14	-01	09	08	02	05	09	14	23	21	10	13	14	24	39	20	20	--	19
26.	-13	-10	-05	-09	-02	12	02	07	11	12	10	-05	00	10	11	06	16	23	26	16	33	21	14	40	17	--

Note.--Correlations for males are shown above the diagonal and for females below the diagonal.

are presented above the diagonal and correlations for females below it. In general, there are (1) moderate correlations among measures of academic potential and performance, (2) moderate, but lower, correlations among non-classroom achievements in the same or closely related areas, (3) low to moderate relationships among non-classroom achievements in areas which are not closely related, and (4) low relationships between non-classroom achievements and measures of academic potential and performance. These relationships are consistent with what previous investigators have found (Holland, 1958, 1959, 1960, 1961; Holland & Astin, 1962; Nichols & Holland, 1963; Holland & Nichols, 1964; Holland & Richards, 1965; Richards et al., 1966b).

The main effects of excluding high Infrequency students are to increase the correlations among non-classroom achievements in the same area, to decrease the correlations among non-classroom achievements in different areas, and to leave the correlations between academic and non-classroom accomplishment unchanged. These results again suggest that student distortion of achievement had little effect on our results. The results also suggest that most students give a frank account of their accomplishments. Further evidence for this is provided by the high correlations between college-reported and student-reported college GPA. Since the students merely estimated their overall average on a seven-alter-

native question, these correlations are probably close to the limits imposed by the reliabilities of the variables.

The correlations in Tables 5 and 6 are based on combining students at the various colleges into a single group. Although it seems unlikely, the obtained relationships may be artifacts of combining students in different colleges. The most important relationships for this study are those between academic and non-academic achievement and those between non-academic achievement in the same area in high school and college. Information about these relationships at individual colleges is summarized in Table 7. The data in Table 7 are restricted to males at the 34 colleges having 25 or more students with complete data and with high Infrequency students eliminated.

Table 7

Relationships between High School and College Achievements at Individual Colleges (Males with High Infrequency Students Eliminated)

	High School GPA		Corresponding HS Non-Aca. Ach. Sc.	
	Range	Median	Range	Median
College GPA (Rep by coll.)	14 to 75	47	--	--
Recognition Aca Acc	-20 to 62	24	--	--
Coll. Leadership Ach	-21 to 43	05	-23 to 53	24
Coll. Musical Ach	-23 to 12	-03	0 to 73	39
Coll. Sp & Dr Ach	-24 to 15	-02	-13 to 56	32
Coll. Art Ach	-21 to 20	-05	09 to 77	41
Coll. Writ Ach	-25 to 23	04	-10 to 65	30
Coll. Sci Ach	-26 to 21	05	-01 to 74	28

The results in Table 7 indicate that there is, indeed, considerable variation among colleges in the relationship between individual predictors

and individual criteria. However, the median correlations in Table 7 are very close to the corresponding correlations in Table 6, which were calculated using all students combined. Moreover, the differences among colleges apparently are more random than consistent and meaningful. These results suggest, therefore, that combining students from different colleges has not distorted the relationships between variables, and that, in fact, the correlations based on the combined students are the best estimates of these relationships.[6] Inspection of the correlations at individual colleges for the other variables in this study and for females supported this interpretation.

As a next step, we computed multiple correlations by selecting the most efficient predictors of each criterion. In previous research, we found that sophisticated computer procedures using F tests for significance in reduction of residual variance are not entirely satisfactory when the N is large, because many variables which produce a statistically significant reduction in residual variance have no practical effect on the size of the multiple correlation. Accordingly, in the present study we selected predictors by using

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[6]Another possibility is that combining students is justified, but two-year and four-year colleges should be treated separately. As a check on this possibility, correlation matrices were computed for the two groups of colleges and are presented in the Appendix. Only minor variations were obtained, a further indication that combining students from all colleges is appropriate.

the Wherry-Doolittle procedure and retaining variables which increased the shrunken multiple correlation by at least .01.

The beta weights and multiple correlations for the academic criteria--college GPA and Recognition for Academic Accomplishment--are shown in Table 8. For all measures of academic accomplishment the best predictor is high school grades, and some weighted combination of high school grades and ACT test scores is a slightly better predictor than high school grades alone. This finding is consistent with a large number of previous investigations of the prediction of academic performance (American College Testing Program, 1965).

Table 8

Beta Weights and Multiple Correlations for Predicting Academic Accomplishment

	Men			Women		
Criterion	Predictors	Beta	R	Predictors	Beta	R
College GPA (Coll. Rep.)	High School GPA	3580	50	High School GPA	4313	54
	ACT Soc Stu	1790	55	ACT Eng	2861	60
	ACT Math	1536	57			
College GPA (Stu. Rep.)	HS GPA	3933	47	HS GPA	4301	52
	ACT Soc Stu	1966	50	ACT Eng	2366	56
Rec. Aca. Acc. (All Students)	HS GPA	2523	30	HS GPA	2014	25
	ACT Math	1014	31	HS Sci Ach	1129	27
				ACT Math	0943	29
Rec. Aca. Acc. (High Infre. Students Elim.)	HS GPA	2403	30	HS GPA	2000	25
	ACT Math	1271	32	HS Sci Ach	1044	27
				ACT Math	0918	28

Note.--In this and the following three tables, only variables increasing the shrunken multiple correlation by at least .01 are retained. The correlation shown beside each variable is the multiple correlation with the designated criterion of that variable plus those listed above it.

The results for the Recognition for Academic Accomplishment scale are especially important. This scale is a self-report of achievements exactly comparable to the non-classroom achievement scales, and it shares their statistical defects of extreme skewness and many zero scores. Furthermore, the items for this scale were mixed with items from the non-academic achievement scales in the same section of the follow-up questionnaire. Unlike the non-classroom achievement scales, however, this scale was designed so it should be correlated with academic achievement. Because this scale was moderately correlated with academic predictors, these results militate against the hypothesis that the low correlation between academic and non-academic accomplishment is entirely due to response bias, dissimulation, statistical defects of the non-academic achievement scales, or similar occurrences. The lower correlations for this scale than for grades may indicate only that not all students with high grades receive public recognition, especially during their freshman year.

Some non-academic achievement scales--leadership, music, speech and drama, art, writing, and science--were designed specifically to assess at the college level the same kinds of non-classroom achievement measured by the high school scales. The beta weights and multiple correlations for these criteria for men are summarized in Table 9 and those for women, in Table 10.

Table 9

Beta Weights and Multiple Correlations
for Predicting Criteria of Non-Academic Accomplishment
Highly Comparable to the High School Achievement Scales
(Males)

	All Students			High Infrequency Stu. Elim.		
Criterion	Predictors	Beta	R	Predictors	Beta	R
C. Lead Ach						
	HS Lead Ach	--	23	HS Lead Ach	2102	25
				HS Writ Ach	1206	27
C. Mus Ach						
	HS Music Ach	3567	32	HS Mus Ach	--	38
	HS Writ Ach	-1048	33			
C. Sp&Dr Ach						
	HS Drama	2053	21	HS Drama	--	27
	ACT Math	-0777	22			
C. Art Ach						
	HS Art Ach	--	31	HS Art Ach	--	41
C. Writ Ach						
	HS Writ Ach	--	22	HS Writ Ach	--	32
C. Sci Ach						
	HS Sci Ach	2410	21	HS Sci Ach	--	28
	HS Drama	-0816	22			

Table 10

(Females)

	All Students			High Infrequency Stu. Elim.		
Criterion	Predictors	Beta	R	Predictors	Beta	R
C. Lead Ach						
	HS Lead Ach	1623	20	HS Lead Ach	1759	21
	HS Writ Ach	0967	22	HS Writ Ach	1002	23
C. Mus Ach						
	HS Music Ach	3567	35	HS Music Ach	3762	37
	ACT English	-1114	37	ACT English	-1026	38
C. Sp&Dr Ach						
	HS Drama	2904	26	HS Drama	--	28
	HS Sci Ach	-0846	27			
C. Art Ach						
	HS Art Ach	--	34	HS Art Ach	4084	42
				HS Writ Ach	1051	43
C. Writ Ach						
	HS Writ Ach	2837	30	HS Writ Ach	3000	35
	HS Drama	1261	31	HS Art Ach	1019	37
	HS Sci Ach	-1017	33	HS Drama	1078	38
C. Sci Ach						
	HS Sci Ach	--	21	HS Sci Ach	2476	26
				HS Writ Ach	0829	27

The results in Tables 9 and 10 underline the great importance of specific content in predicting achievement and strengthen earlier findings (Richards et al., 1966b). In each case, the best predictor of achievement in college is similar achievement in high school; and in many cases similar high school accomplishment is the only variable contributing to the prediction of college accomplishment. Moreover, in the remaining cases, the prediction of non-academic accomplishment is improved only slightly by adding variables to the corresponding high school scale--an improvement likely to disappear on cross-validation. These findings are consistent, of course, with a substantial literature showing that past performance predicts future performance. The information in Tables 9 and 10 also confirms earlier findings that academic potential and success contribute little or nothing to the prediction of non-classroom success (Astin, 1962; MacKinnon, 1960; Torrance, 1963; Taylor, Smith & Ghiselin, 1963; Price, Taylor, Richards, & Jacobsen, 1964; Gough, Hall, & Harris, 1963; Hoyt, 1965; Thorndike & Hagen, 1959).

The results in these tables show further that the only major change resulting from the elimination of high Infrequency students is some increase in the predictive validity of the high school achievement scales. Overall, the results with the high Infrequency students eliminated indicate that a tendency of a few students to exaggerate their accomplishments may change some of the details of the rela-

tionships among academic potential, academic achievement, and non-academic accomplishment, but this tendency will not change the main patterns and interpretations of such relationships.

The remaining criteria make our assessment of college student accomplishment more comprehensive; but they were not planned specifically to measure achievement in the same areas in high school. They include: social participation, social service, business, humanistic-cultural, religious, and social science achievement. Table 11 shows what high school assessments predict these criteria of college achievement. The exact magnitude of the correlations is less of an issue for these criteria, and eliminating the high Infrequency students seems to reduce error somewhat. Therefore, high Infrequency students were excluded from the computations summarized in Table 11.

Table 11

Beta Weights and Multiple Correlations
for Predicting Criteria of Non-Academic Accomplishment
Not Highly Comparable to the High School Achievement Scales
(High Infrequency Students Eliminated)

	Men			Women		
Criterion	Predictors	Beta	R	Predictors	Beta	R
C. Soc Par						
	HS Lead Ach	2403	29	HS Lead Ach	1907	24
	HS Writ Ach	1507	32	HS Writ Ach	1414	26
				ACT English	-1191	29
C. Soc Ser Ach						
	HS Lead Ach	1211	16	HS Lead Ach	1190	17
	HS Drama	1052	19	HS Sci Ach	0930	19
				HS Writ Ach	0950	21
				ACT Math	-0865	23

Table 11 (cont.)

Criterion	Men			Women		
	Predictors	Beta	R	Predictors	Beta	R
C. Bus Ach						
	HS GPA	-0937	09	HS Lead Ach	0693	07
	HS Drama	0747	12	ACT English	-0693	10
C. Hum-Cul Ach	HS Writ Ach	2178	26	HS Writ Ach	2350	27
	HS Sci Ach	1503	29	HS Sci Ach	1355	30
	ACT Math	-2197	31	HS Art Ach	1041	32
	ACT Soc Stu	1732	33	ACT Math	-1685	34
				ACT Soc Stu	1207	35
C. Rel Ser						
	HS Drama	1081	14	HS Drama	1159	14
	ACT Math	-1050	17	ACT English	-1342	17
	HS Writ Ach	0753	19	HS Music Ach	0775	19
				HS GPA	0778	20
C. Soc Sci Ach						
	HS Writ Ach	1474	16	ACT English	-1629	13
	ACT Math	-1568	21	HS Writ Ach	1454	20
	HS Sci Ach	0984	24	HS Art Ach	0957	22

As was expected, the multiple correlations in Table 11 are somewhat lower than the correlations in Tables 9 and 10, and one would expect them to drop further on cross-validation. Consequently, a better approach to predicting these variables probably is to construct a high school achievement scale corresponding closely to the college achievement scale. For the most part, the correlations in Table 11 support the conclusion that high scores on academic predictors tell little about a student's potential for non-classroom accomplishment.

Discussion

This study lends further support to our research to establish that some non-academic accomplishments are independent of academic potential and accomplishment (Holland & Richards, 1965, 1966), that non-academic accomplishment can be assessed with moderate reliability (American College Testing Program, 1965; Richards et al., 1966a), and that non-academic accomplishment can be predicted with moderate success (Holland & Nichols, 1964; Richards et al., 1966b). The present study strengthens these earlier investigations in several ways. The sample is large and diverse with a full range of talent; it was drawn from a wide variety of colleges; and it was designed specifically to evaluate the relationships in question. The predictive data were collected as part of a college admissions testing program, while the criterion data were collected as part of a research project on which there was no incentive for students to dissimulate or exaggerate their achievements. Moreover, for the first time the predictive data were obtained prior to college entrance. Finally, the use of both high school and college Infrequency scales provided evidence that the overall meaning and pattern of the predictive relationships is little effected by possible student distortion of their achievements.

The present study establishes that it is possible to predict non-academic accomplishment with moderate success. Because the high school non-academic achievement scales are a regular part

of a national college admission assessment, however, it is important to discuss in some detail the magnitude of the predictive validities and the implications of those magnitudes.

It is clear that by conservative or traditional standards these validities are unsatisfactory. The median correlation between high school and college accomplishment in the same area is only .25 when all students are considered and .30 when high Infrequency students are eliminated. It must be remembered, of course, that the non-academic achievement scales are much shorter than the typical test of academic potential. Relative to their length, therefore, the validities of these brief scales with a short history of development compare rather favorably with the validities for typical tests of academic potential which have a history of development of about fifty years. There are a number of other reasons, however, for rejecting the negative verdict of conventional standards for test validity.

First, at many colleges, freshmen are prevented by student regulations from participating in many of the activities tapped by the non-academic achievement scales. Therefore, even if the "true" validity of the high school achievement scales is high, the obtained validities would be lower in the freshman year. In an earlier study using similar scales, (Richards et al., 1966b) we did find that the predictive validities of high school achievements increased as a function of the length of time students had been in college. Second,

it has long been known (Taylor & Russell, 1939) that quite low correlations yield satisfactory success ratios when selection ratios are moderate, and impressive success ratios when selection ratios are stringent. College admissions typically involve moderate to stringent selection ratios. Third, the skewed distributions of the scales impose real limits on the possible magnitude of the correlation. To a degree, therefore, to criticize the low validities is to argue with "nature" rather than with the non-academic achievement scales. The relatively high validities for self-reported high school grades support this interpretation. It is likely, moreover, that the Pearson correlations give a conservative estimate of how likely it is that a college achiever will have achieved in the same area in high school.

The most important reason for rejecting the verdict of traditional standards, however, is that the rationale for the non-academic achievement scales grows out of an entirely different conceptual framework than that of traditional standards. Traditional standards assume that only one decision is involved in evaluating a person's potential for success, whether or not he is likely to do well on a single criterion. On the other hand, the non-academic achievement scales are based on the assumption that there are many kinds of excellence, and therefore many criteria for us to predict. Consequently, evaluating a person's potential for success involves many decisions rather than a single one. Cronbach and Gleser (1957)

have convincingly shown that, in such a situation, many short tests with moderate or even low validities against several criteria are more appropriate than a single long test with a high validity against one criterion.

A final objection to such devices can be dealt with more summarily. It is sometimes objected that if such devices were used in selecting college students, high schools would become aware of this and would encourage their students to participate in the kind of activities leading to high scores. But this would amount to encouraging their students to become actively involved in such important human endeavors as art, literature, drama, music, and science. Such an outcome hardly seems undesirable.

References

American College Testing Program. ACT technical report. Iowa City: Author, 1965.

American College Testing Program. Interpretive guide for ACT Research Services, 1966-67 edition. Iowa City: Author, 1966.

Astin, A. W. A note on the relationship between creative and academic achievement. Evanston, Ill.: National Merit Scholarship Corporation, 1962.

Astin, A. W. Who goes where to college? Chicago: Science Research Associates, 1965.

Astin, A. W., & Holland, J. L. The Environmental Assessment Technique: A way to measure college environments. Journal of Educational Psychology, 1961, 52, 308-316.

Committee on School and College Relations. Admission to American colleges. New York: Educational Records Bureau, 1964.

Cronbach, L. J., & Gleser, G. C. Psychological tests and personnel decisions. Urbana, Ill.: University of Illinois Press, 1957.

Davidsen, O. M. Reliability of self-reported high school grades. Unpublished research report, American College Testing Program, 1963.

Eells, K. How will the ACT tests serve Illinois needs? --A research report. Committee on Freshman Testing, Illinois Joint Council on Higher Education, 1962.

Gough, H. G., Hall, R. E., & Harris, W. B. Admissions procedures as forecasters of performance in medical education. Journal of Medical Education, 1963, 38, 983-998.

Guilford, J. P. Fundamental statistics in psychology and education. New York: McGraw-Hill, 1956.

Holland, J. L. A personality inventory employing occupational titles. Journal of Applied Psychology, 1958, 42, 336-342.

Holland, J. L. The prediction of college grades from the California Psychological Inventory and the Scholastic Aptitude Test. Journal of Educational Psychology, 1959, 50, 135-142.

Holland, J. L. The prediction of college grades from personality and aptitude variables. Journal of Educational Psychology, 1960, 51, 245-254.

Holland, J. L. Creative and academic performance among talented adolescents. Journal of Educational Psychology, 1961, 52, 136-147.

Holland, J. L. A psychological classification scheme for vocations and major fields. Journal of Counseling Psychology, 1966, 13, 278-288.

Holland, J. L. & Astin, A. W. The prediction of the academic, artistic, scientific, and social achievement of undergraduates of superior scholastic aptitude. Journal of Educational Psychology, 1962, 53, 132-143.

Holland, J. L. & Nichols, R. C. Prediction of academic and extra-curricular achievement in college. Journal of Educational Psychology, 1964, 55, 55-65.

Holland, J. L., & Richards, J. M., Jr. Academic and nonacademic accomplishment: correlated or uncorrelated? Journal of Educational Psychology, 1965, 56, 165-174.

Holland, J. L., & Richards, J. M., Jr. Academic and nonacademic achievement in a representative sample taken from a population of 612,000. ACT Research Report No. 12. Iowa City: American College Testing Program, 1966.

Hoyt, D. P. Three years of research in the American College Testing Program. Paper read at Iowa Psychological Association, Des Moines, 1963.

Hoyt, D. P. The relationship between college grades and adult achievement: a review of the literature. ACT Research Report No. 7. Iowa City: American College Testing Program, 1965.

MacKinnon, D. W. What do we mean by talent and how do we test for it? In The search for talent. New York: College Entrance Examination Board, 1960. Pp. 20-29.

Munday, L. Comparative predictive validities of the American College Tests and two other scholastic aptitude tests. ACT Research Report No. 6. Iowa City: American College Testing Program, 1965.

Munday, L. Predicting college grades from ACT data. Educational and Psychological Measurement, in press.

Nichols, R. C., & Holland, J. L. Prediction of the first year college performance of high aptitude students. Psychological Monographs, 1963, 77 (7, Whole No. 570).

Price, P. B., Taylor, C. W., Richards, J. M., Jr., & Jacobsen, T. L. Measurement of physician performance. Journal of Medical Education, 1964, 39, 203-211.

Richards, J. M., Jr., Holland, J. L., & Lutz, Sandra W. The assessment of student accomplishment in college. ACT Research Report No. 11. Iowa City: American College Testing Program, 1966. (a)

Richards, J. M., Jr., Holland, J. L., & Lutz, Sandra W. The prediction of student accomplishment in college. ACT Research Report No. 13. Iowa City: American College Testing Program, 1966. (b)

Richards, J. M., Jr., Rand, L. P., & Rand, Lorraine M. Regional differences in junior colleges. ACT Research Report No. 9. Iowa City: American College Testing Program, 1965.

Richards, J. M., Jr., Rand, Lorraine M., & Rand, L. P. A description of junior colleges. Journal of Educational Psychology, 1966, 57, 207-214.

Taylor, H. C., & Russell, J. T. The relationship of validity coefficients to the practical effectiveness of tests in selection. Journal of Applied Psychology, 1939, 23, 565-578.

Taylor, C. W., Smith, W. R., & Ghiselin, B. The creative and other contributions of one sample of research scientists. In C. W. Taylor and F. Barron (Eds.), Scientific creativity: its recognition and development. New York: Wiley, 1963. Pp. 228-250.

Thorndike, R. L., & Hagen, Elizabeth. 10,000 careers. New York: Wiley, 1959.

Torrance, E. P. Education and the creative potential. Minneapolis: University of Minnesota Press, 1963.

APPENDIX

Table A

Intercorrelations of Predictors and Criteria for All Students at Two-Year Colleges

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1.	--	60	67	67	32	-04	07	03	00	06	03	38	33	14	06	04	-01	07	08	-02	01	-02	-04	02	-06	-05
2.	59	--	53	58	40	-08	02	-05	-07	-03	06	42	34	17	05	-04	-06	-02	01	04	-02	-03	-04	-06	-06	-11
3.	69	55	--	71	30	-03	01	01	-04	09	00	39	34	14	08	-01	-02	04	11	-03	05	03	-03	12	-05	01
4.	64	60	71	--	32	-04	09	05	-01	04	11	37	33	13	06	02	-04	04	07	03	02	01	-06	02	-06	-08
5.	36	38	33	35	--	11	-05	06	01	07	08	50	46	28	09	-03	01	00	06	05	00	-03	-07	01	01	-02
6.	03	00	02	04	14	--	22	46	21	41	33	07	09	08	27	05	09	11	12	05	31	18	10	18	10	19
7.	07	05	04	08	07	24	--	33	30	32	32	03	04	01	04	36	11	15	03	-01	03	04	02	-03	08	-01
8.	00	-02	01	09	10	42	34	--	37	56	44	08	08	09	16	07	25	15	19	02	19	20	06	14	14	12
9.	-02	-03	02	02	-04	19	24	36	--	48	45	02	02	-01	10	04	11	41	12	05	09	06	04	06	04	04
10.	18	03	13	14	19	40	28	46	35	--	46	09	09	05	17	01	14	16	25	01	18	10	02	18	04	11
11.	-04	02	00	07	10	30	34	39	41	41	--	05	06	06	08	08	09	18	13	22	14	11	03	15	06	11
12.	49	46	45	47	52	04	10	05	-03	09	00	--	85	37	19	-02	02	03	09	03	05	00	-07	03	-01	-03
13.	46	41	41	43	52	09	10	09	00	13	04	87	--	37	21	01	05	08	12	05	07	03	-01	08	05	03
14.	16	21	17	18	29	15	10	09	08	18	15	35	38	--	20	00	15	05	13	13	12	09	00	11	07	07
15.	10	09	06	09	12	22	11	19	11	20	13	16	16	28	--	10	19	24	21	02	42	44	16	12	13	14
16.	-04	-01	-03	01	05	07	37	11	01	08	15	00	07	11	13	--	14	19	11	06	11	15	18	10	15	07
17.	00	-04	00	04	08	16	12	32	-01	15	02	04	04	11	18	22	--	22	32	06	27	27	13	29	24	20
18.	04	00	05	05	-09	13	10	15	35	17	09	-08	-01	04	16	10	12	--	28	18	31	25	16	22	13	16
19.	11	02	14	11	05	20	09	20	14	32	06	01	08	06	17	07	24	37	--	16	29	17	18	44	20	36
20.	-09	-02	-08	00	03	11	07	09	02	10	15	00	04	12	05	17	09	14	17	--	17	12	13	27	15	22
21.	-03	00	01	00	-04	23	08	17	04	17	07	-11	-04	08	30	09	16	30	28	16	--	43	28	35	20	31
22.	-03	-03	-04	00	00	22	13	18	07	18	17	-03	02	12	40	14	19	21	19	15	39	--	26	24	31	24
23.	-07	-04	-09	-12	-03	11	09	03	-03	06	07	-09	-01	10	17	13	11	14	12	16	23	28	--	20	20	18
24.	01	-05	13	06	00	17	10	19	15	25	13	-06	04	10	14	15	21	37	46	23	33	22	17	--	17	49
25.	-01	00	-06	01	08	12	18	16	02	12	10	05	07	09	17	23	25	10	15	17	18	34	18	19	--	23
26.	-10	-06	03	-03	00	11	03	13	13	14	10	-09	00	10	09	06	08	26	26	20	27	16	10	42	11	--

Note. --Correlations for males are shown above the diagonal and for females below the diagonal.

Table B

Intercorrelations of Predictors and Criteria
for All Students at Four-Year Colleges

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1.	--	71	77	74	44	-02	01	-05	-11	05	02	42	36	22	01	-04	-04	-04	03	02	-09	-09	-04	00	-10	-11
2.	68	--	71	74	48	-06	-02	-08	-13	-03	09	45	34	24	03	-08	-11	-08	-03	02	-12	-10	-05	-09	-13	-15
3.	79	69	--	80	42	-05	-03	-05	-09	04	07	43	34	20	03	-06	-01	-03	04	03	-06	-07	-02	05	-11	-06
4.	77	68	80	--	41	-07	00	-05	-05	00	11	38	29	17	01	-08	-05	-05	-01	03	-09	-08	-03	-02	-12	-11
5.	37	44	39	36	--	12	02	02	-08	08	09	50	48	31	04	-06	-06	-07	-04	04	-04	-04	-06	00	-03	-05
6.	-08	-01	-08	-08	11	--	23	42	25	43	29	02	05	08	20	06	12	08	11	05	23	13	05	15	09	08
7.	03	07	03	00	02	22	--	37	32	37	29	00	00	04	07	30	02	06	04	06	05	04	08	08	07	00
8.	-04	-06	-04	-04	05	40	24	--	39	53	34	-02	00	01	11	05	19	06	09	01	14	08	07	11	10	06
9.	03	01	02	03	-07	22	17	29	--	49	39	-06	-04	-03	04	01	05	25	04	04	06	04	06	06	04	03
10.	17	11	15	12	11	37	20	46	38	--	38	03	08	07	14	03	09	10	20	03	15	09	05	18	10	11
11.	-02	00	01	02	07	27	15	33	47	41	--	03	03	07	04	05	00	13	02	20	07	03	07	11	02	03
12.	42	42	43	40	55	08	06	05	03	10	04	--	84	40	11	-03	-01	-02	03	03	-03	00	-06	03	-06	-02
13.	35	35	35	34	53	10	07	05	02	12	10	86	--	40	18	00	03	02	07	04	06	05	-03	08	03	03
14.	13	16	14	12	23	09	05	03	07	06	11	44	42	--	22	14	18	13	21	23	13	14	11	15	06	16
15.	05	03	07	04	04	21	11	15	10	13	13	14	11	18	--	13	21	24	30	17	45	42	17	16	21	18
16.	-12	-07	-09	-09	-05	07	33	12	02	04	02	-05	-01	02	07	--	26	25	30	29	19	21	25	21	25	29
17.	-04	-02	-02	-04	-02	12	03	22	10	12	02	02	03	10	19	19	--	34	43	26	36	32	23	33	22	38
18.	03	00	03	02	-09	11	05	13	34	11	11	-03	-02	06	18	12	21	--	40	32	36	33	27	31	23	27
19.	08	03	09	07	-01	11	05	23	11	28	07	00	02	08	19	13	29	27	--	30	41	31	27	45	24	44
20.	-04	00	-01	-01	03	08	06	05	11	11	25	01	05	02	06	03	02	11	08	--	24	27	33	30	20	33
21.	-14	-14	-13	-14	-04	23	06	18	09	14	10	-05	-01	10	24	12	24	28	27	13	--	44	24	35	28	36
22.	-07	-08	-04	-07	-02	16	07	09	07	10	08	-03	00	09	30	15	22	25	17	10	39	--	27	30	38	33
23.	-04	00	-01	-02	-01	07	-03	06	00	00	00	-05	-03	05	11	13	08	09	14	13	13	16	--	23	27	24
24.	-03	-07	01	-03	-01	16	03	16	12	24	19	-02	04	11	16	11	22	30	41	15	32	27	11	--	22	47
25.	-16	-11	-10	-11	03	13	06	14	01	09	09	-02	03	10	11	24	19	11	12	11	31	43	19	22	--	22
26.	-17	-13	-11	-14	-03	13	00	05	05	08	08	-03	00	12	14	13	25	20	29	12	38	25	18	40	24	--

Note. --Correlations for males are shown above the diagonal and for females below the diagonal.

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